JoSSEd
Journal of Science and Science Education
ISSN: 2774-1869 eISSN: 2774-2105
Research Paper

DEVELOPMENT OF STEM INTEGRATED LKPD THROUGH LESSON STUDY ACTIVITIES TO IMPROVE SCIENTIFIC LITERACY AND SCIENCE PROCESS SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

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DOI: 10.29303/jppipa.v6i1.264

Article Info
Received:
Revised:
Accepted:

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Abstract: This research aims to develop STEM-integrated LKPD through lesson study activities to improve scientific literacy and science process skills. LKPD development adopts the ADDIE (Analyse, Design, Develop, Implementation and Evalution) development model. The STEM integrated LKPD feasibility instrument used is the product feasibility questionnaire. The practical instruments used are observation sheets on the implementation of learning activities, teacher response questionnaires, and student response questionnaires. The STEM integrated LKPD instruments used are scientific literacy tests and science process skills. Feasibility data and practicality data were analyzed using percentage equations, while effectiveness data were analyzed using the Normality-Gain (N-Gain) test. The results of the feasibility test show that the STEM integrated LKPD has a very feasible category (86.40%) for use in science learning. The results of the practicality test showed that STEM integrated LKPD was proven to be very practical (85.05%) used in the learning process (82%), for teachers (87.50%), and for students (85.66%). Meanwhile, the results of the effectiveness test of the product developed for scientific literacy skills were with an N-Gain value of 0.50 (medium) and the results of science process skills analysis were 0.60 (medium). So it can be concluded that this STEM integrated LKPD is quite effective in increasing students' scientific literacy and science process skills.

Keywords : *LKPD, STEM, Science Literacy, Science Process Skills.*

Citation: **Example:**Susilawati, S., Doyan, A., Muliyadi, L., & Hakim, S. (2019). Growth of tin oxide thin film by aluminum and fluorine doping using spin coating Sol-Gel techniques. *Journal of Science and Science Education (JoSSEd), 1*(1), 1-4. doi: https://doi.org/10.29303/jppipa.v1i1.264
Book Antiqua 9pt, Space 1, Justify (APA Format)

INTRODUCTION

Freedom to learn is a strategic policy in order to realize the transformation of education management in Indonesia which aims to encourage improvements in the quality of learning and student learning outcomes. One of the Independent Learning policies is to replace the National Examination with a National Assessment, known as the National Assessment (AN) which measures literacy, numeracy, character and environmental surveys [1].

The National Assessment will measure basic skills, namely literacy and numeracy. Ability to reason about text and numbers. These competencies are built from basic to intermediate levels in a "learning progression". Reading literacy and numeracy are two minimum competencies for students to learn throughout their lives and be able to contribute to society [2]. Based on the results of the assessment and learning center survey, the rollout of this national assessment policy has had an impact on the implementation of learning and assessment in schools. Schools still have national assessment results that have not reached the minimum competency [1].

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Efforts that can be made to overcome this problem are to improve the learning process in subjects tested at the national assessment at junior high school level. One of the subjects tested in the national assessment is the science subject. The literacy skills that junior high school students must have are scientific literacy, numeracy, reading and writing, financial, culture and citizenship, and digital. Scientific literacy skills are important literacy skills for increasing national assessment scores in science subjects.
The ability to reason in learning as intended includes observing, asking, trying, processing, presenting, concluding and creating in several subjects. In science learning, reasoning skills can be applied through science process skills. Science process skills are skills used by scientists in carrying out scientific investigations [3]. Science process skills are skills that involve all students' abilities in acquiring knowledge based on phenomena. Science process skills are closely related to science learning. Science learning aims to enable students to master science concepts [4].

21st century science education utilizes technology in learning. In science subjects, technology is used to support learning process activities. There are several approaches that can be used in 21st century learning. One of them is the Science, Technology, Engineering, and Mathematics (STEM) approach. STEM is an approach that helps students to learn actively [5] in learning activities and solving problem [6]. STEM means teaching and learning that is closely related to the field of science, the study of natural phenomena objectively [7]. STEM-based learning trains students to apply their knowledge by creating designs as a form of solving problems related to the environment [8].

The development of STEM-based LKPD is suitable for use in learning with a validation rate of material experts of 92.75% and design experts of 82.08%, and teacher results of 93.04%. The results of research conducted by [9] in class VII junior high school students showed a scientific literacy score of 62.21 (in the good category) and a learning achievement percentage of 100% (very good category) through the use of STEM-based water pollution worksheet. Furthermore, the results of data analysis on LKPD development based on the STEM approach and students' science process skills had a mean pretest score of 20.70, increasing to 75.63 in the very good category [10].

Based on this description, it is necessary to conduct research on the development of STEM-integrated LKPD through lesson study activities. The expected benefit from the results of this research is as motivation to use learning tools and learning models that are better and in accordance with the development of scientific literacy and science process skills of junior high school students. Therefore, the development of STEM-integrated LKPD through lesson study activities needs to be implemented to improve the scientific literacy and science process skills of junior high school students.

METHOD

This research is Research and Development (R & D) research. The development model in this research is the ADDIE model developed by Lee & Owens (2004) which consists of analysis, design, development, implementation and evaluation. This research was conducted at MTsN 4 East Lombok and SMP IT Dhia'ul Fikri. The type of research used is One Group Pretest-Posttest. Data analysis techniques are used to determine the feasibility, practicality and effectiveness of the LKPD that has been developed.
The instruments in this research are teaching modules, LKPD, and scientific literacy tests, and science process skills. The scientific literacy test uses 20 multiple choice questions. The science process skills test uses 5 description questions. The test is carried out at the beginning of the meeting (pretest) and the end of the meeting (posttest).

RESULTAND DISCUSSION

A. Research Procedure Stage

The following are details of the results of research that has been carried out in accordance with the ADDIE development model. At the analysis stage, design stage, development of results at the development stage, results of validation by expert teams or expert validators, results of implementation of lesson study activities, limited scale trial results, wide scale trial results, evaluation results (evaluate).

The analysis stage began with literature studies and field studies. The literature study includes details of material based on the independent curriculum contained in the ATP, teaching modules, approaches and learning models used, stages in designing products in the form of integrated LKPD Science, Technology, Engineering, Mathematics (STEM) through lesson study activities, and research related to scientific literacy and science process skills.

The design stage consists of the material preparation stage, the format and template selection stage, as well as the initial product design stage in the form of the developed LKPD. The aim of this stage is to design a product in the form of a STEM integrated worksheet through lesson study activities that can improve students' scientific literacy and science process skills.

The development stage is carried out with an initial draft created at the design stage which is then validated by experts. The purpose of validation is to determine the quality of the product being made, whether it is valid for

use or still needs improvement. Product validation is carried out by three expert lecturers. The results of the validation will be used to make revisions to the initial product. After draft 1 is revised according to the validation results, draft 2 will appear which will then be tested on students in the product trial stage. The validity of this STEM integrated LKPD is obtained based on the validity results obtained based on the product assessment sheet developed in the form of ATP, teaching modules, LKPD integrated STEM, scientific literacy instruments, and science process skills instruments.

This implementation stage contains several stages of LKPD trials which have been declared suitable for testing from expert validation assessments. This stage aims to determine practicality through student and teacher responses to the product being developed. Products that have been declared suitable will be tested on class VII students in junior high school. The implementation stage ranges from limited trials to wide-scale trials.

The final stage of LKPD development is evaluating the use of the LKPD that has been produced and tested. The evaluation stage in question can be interpreted as the process of determining the value and benefits of an object being assessed in research.

The effectiveness of the LKPD that has been created is measured through scientific literacy instruments and scientific process skills instruments. The developed LKPD can be said to be effective if there is an increase from pretest to posttest results. Effectiveness testing is carried out on products that have been developed by involving product users,

B. Development of STEM Integrated LKPD

The results of the STEM integrated LKPD development product after several revisions are as follows. STEM integrated LKPD consists of learning outcomes and learning objectives, concept maps and keywords, LKPD work instructions, learning activity pages, LKPD materials, seeing the natural side, let's discuss, and let's try.

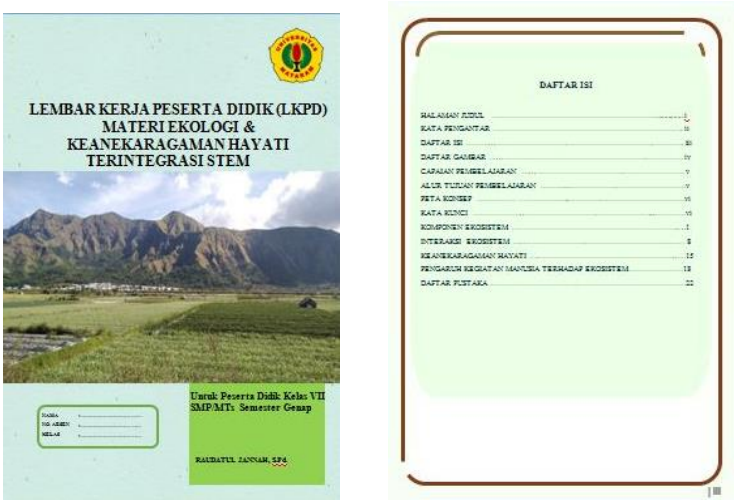

Figure 1. LKPD Model Design

C. Product Analysis Results

1. Product feasibility analysis

The assessment results from expert validators show that the STEM integrated LKPD developed meets the feasibility criteria. The average percentage of eligibility for ATP, teaching modules, LKPD, scientific literacy instruments and science process skills instruments is > 80.00% in the very feasible category (Table 1).

Table 1. Product feasibility analysis

Validator	ATP (%)	Teaching Module (%)	LKPD (%)	Science Literacy Instrument (%)	Science Process Skills Instrument (%)
Average	88	88	86	84	86
Category	Very Eligible	Very Eligible	Very Eligible	Very Eligible	Very Eligible

2. Results of product practicality analysis

Based on the results of data analysis on learning implementation, teacher responses, and student responses, the average percentage of practicality of STEM integrated LKPD was 85.05% in the very practical category. Thus, it can be concluded that the product developed meets the practicality criteria, namely that it is very practical to use in science learning activities. The results of the product practicality analysis are presented in Table 2.

Table 2. Product Practicality Analysis Results

Data Source	Percentage (%)	Average (%)	Category
Implementation of learning activities	82		
Teacher response	87,50	85,05	Very Practical
Student response	85,66		

3. Results of product effectiveness analysis

a. Scientific Literacy Ability

The results of data analysis show that students' scientific literacy abilities are in the medium category. These results were obtained based on the average pretest score and the average posttest score on the N-Gain value obtained. The average pretest score was 39, while the average posttest score was 77. Thus, the average N-Gain score for the test group was 0.5 with a moderate increase category (Table 3).

Table 3. Results of N-Gain Analysis of Scientific Literacy

Average Pretest	Average Posttest	Average N-Gain	Category
39	77	0,5	Currently

b. Improvement of Science Process Skills

The results of data analysis show that students' science process skills are in the medium category. These results were obtained based on the average pretest score and the average posttest score on the N-Gain value obtained. The average pretest score was 46, while the average posttest score was 81. Thus, the average N-Gain score for the test group was 0.6 with a moderate increase category (Table 4).

Table 4. Results of N-Gain Analysis of Science Process Skills

Average Pretest	Average Posttest	Average N-Gain	Category
46	81	0,6	Currently

CONCLUSION

Based on the results of the research and discussion, the following conclusions were obtained. STEM integrated LKPD which has been developed into four STEM integrated LKPD with activities based on indicators of scientific literacy and science process skills. The STEM integrated LKPD that has been developed has an N-Gain value of 0.5 and 0.6 respectively in the medium category, so it can be concluded that this STEM integrated LKPD is quite effective in increasing students' scientific literacy and science process skills. The STEM integrated worksheet that has been developed is declared feasible, practical and effective for improving students' scientific literacy abilities and science process skills.

ACKNOWLEDGEMENTS

Thank you very much for my supervisor, Prof. Dr. Agus Ramdani, M.Sc., and Dr. Dadi Setiadi, M.Sc, who always guided me in completing this research. We would also like to thank the Master of Science Education Study Program who always helps complete administration research to conduct this research.

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